

Memorandum

To: Paul H. Gosselin, Assistant Director
Division of Enforcement, Environmental
Monitoring, and Data Management

Date: August 21, 1997

From: Department of Pesticide Regulation - 1020 N Street, Room 161
Sacramento, California 958 14-5624

Subject: METHYL BROMIDE SENSITIVE SITE MONITORING, MONTEREY COUNTY,
JULY - AUGUST, 1997

Introduction

The Department of Pesticide Regulation (DPR) and county agricultural commissioners have implemented permit conditions, including buffer zones, to mitigate unacceptable methyl bromide exposure. A permit recently issued by the Monterey County Agricultural Commissioner was appealed to the director of DPR. After reviewing the permit, the director implemented additional conditions for a scheduled methyl bromide fumigation. Due to the possibility of cold air drainage down a slope, and potentially higher methyl bromide concentrations, DPR required a buffer zone of 200 feet for the side of the field that slopes toward residences. DPR established a buffer zone of 30 feet for the other sides. Buffer zone distances are set so that concentrations measured at this distance do not exceed 0.21 parts per million (ppm; 24-hour time-weighted average). The director also required DPR staff to monitor air concentrations during the fumigation. This memorandum summarizes the results of the monitoring.

Materials and Methods

The 22-acre field was treated in two separate applications. The first application was on July 28, 1997, to approximately 12 acres. The remaining 10 acres were treated on August 1, 1997. The methyl bromide was injected approximately



12 inches beneath the soil surface with shanks attached to a tractor (method 8.1 in permit conditions). The treated area was covered with a “very high barrier” tarpaulin. The target application rate was 300 pounds per acre of formulated product, 80 percent methyl bromide/20 percent chloropicrin mixture.

Monitoring was conducted by placing air samplers (SKC #224-PCXR8) with activated charcoal tubes (SKC #226-38-02) around the perimeter of the treated area. The air flow rate for all samplers was calibrated to 15 milliliters per minute. DPR staff set up two samplers side-by-side (replicates) at selected sites to evaluate sampling and analytical variability. Wind speed, wind direction, air temperature, and relative humidity were recorded every five minutes with a Met-1[®] meteorological station. Sampler locations and number of samples are described below. The California Department of Food and Agriculture’s Center for Analytical Chemistry conducted the laboratory analyses. The samples were extracted with ethyl acetate and analyzed using a gas chromatograph with an electron capture detector.

Materials and Methods for First Application (July 28, 1997)

During the first application, 11.5 acres were treated with a total of 3,600 pounds of formulated product, a rate of 313 pounds per acre. The application started at 6:15 a.m. and ended at 10:50 a.m.

Ambient air samples were collected at 13 locations around the field. Eight samplers were located at the resident buffer zone distance of 30 feet, one at each corner and one at the middle of each side (sites 1 - 8, Figure 1). Due to physical constraints and slight errors in the anticipated location of the field edges, some of the sites were less than 30 feet. Five additional samplers were placed 200 feet from the edge of field at the distance designated as a new buffer zone along the eastern edge of the field closest to the residential area (sites 9 - 13, Figure 1). A series of five samples was collected at each of the 13 locations beginning with start of fumigation: two 6-hour periods and three 12-hour periods for a total of 48 hours.

Materials and Methods for Second Application (August 1, 1997)

The remaining 10 acres of field were treated with a total of 2,925 pounds of formulated product, a rate of 292.5 pounds per acre. The application started at 6:10 a.m. and ended at 12:25 p.m. A delay occurred during application because the wind was blowing toward the residences. The application was continued upon a shift in the wind direction.

Ambient air samples were collected at 17 locations around the field (Figure 2). Seven samplers were located at the resident buffer zone distance of 30 feet, one at each corner and one at the middle of each **side, omitting the tarped** eastern side (sites 1 - 7, Figure 2). Two samplers were placed 60 feet from the west edge of the field (sites 8 - 9, Figure 2). Two samplers were placed 100 feet from the west edge of the field (sites 10 - 11, Figure 2). Five samplers were placed 200 feet from the west edge of the field, the resident buffer zone distance for the west side (sites 12 - 16, Figure 2). One sampler was placed at 30 feet from the eastern edge of the first application area (site 17, Figure 2). A series of five samples was collected at each of the 17 locations beginning with start of fumigation: two 6-hour periods and three 12-hour periods for a total of 48 hours.

Results

Measured air concentrations for the first application are shown in Tables 1. Methyl bromide was detected at five of the 13 monitoring sites. The highest 24-hour time-weighted average concentration detected was 0.230 ppm, 25 feet from the edge of the field (site 7, Figure 1). While this concentration exceeds DPR's target concentration of 0.21 ppm, it occurred five feet inside the resident buffer zone of 30 feet. All five of the sites with detectable methyl bromide were located downwind from the field; methyl bromide was not detected upwind. A background sample collected the night before application had no detectable methyl bromide. Weather during the 48-hour monitoring period was overcast: temperature ranged from 56 to 65 °F, wind speed ranged from 0 to 14 miles per hour, and wind direction was from the west.

Measured air concentrations for the second application are shown in Tables 2. Methyl bromide was detected at all 17 monitoring sites. The highest 24-hour time-weighted average concentration detected at the buffer zone distance (200 feet) was 0.199 ppm (site 14, Figure 2). DPR's target concentration is 0.21 ppm at the buffer zone distance. A background sample collected the night before application contained 0.010 ppm. These concentrations are significantly different from the concentrations detected during the first application. Weather conditions were also significantly different from the first application. The wind direction was variable, but predominantly from the east, opposite of the first application. It was overcast for most of the **48-hour** monitoring period during the first application, while the overcast burned off by mid-morning for the second application. Wind speed was slightly lower, ranging from 0 to 11 miles per hour. Temperature ranged from 54 to 72 °F.

Discussion

The methyl bromide concentrations measured did not exceed DPR's target level at the buffer zone distances for either application, but were higher than expected. DPR established a 200 foot buffer zone on the sloped side of the field because of the potential for cold air drainage. However, cold air drainage was not apparent, and concentrations should not have exceeded DPR's target level of 0.21 ppm (24-hour time-weighted average) at 30 feet. Concentrations exceeding the target level were detected as far as 100 feet from the edge of the field for **the** second application. The range of methyl bromide concentrations detected are roughly similar for four of the five time periods monitored (**1, 2, 4, 5**). The third period (the night following application) shows large differences in concentration and it accounts for the higher 24-hour average concentrations detected during the second application. The highest concentration detected during the third period for the first application was 0.223 ppm, versus 0.841 ppm for the second application

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Based on the preliminary data, weather seems to account for at least part of the difference in monitoring results between applications. Wind speed during the night following the first application was less than three miles per hour for three of the 12 hours monitored. Wind speed during the night following the second application was less than three miles per hour for five of the 12 hours monitored. In general, the lower the wind speed, the higher the air concentration. The sky was overcast throughout the night of the first application, while it was clear until early morning during the night of the second application. Clear skies at night create more stable atmospheric conditions and less mixing of the air. All other factors being equal, the more stable the atmosphere the higher the methyl bromide air concentration.

The predominant wind direction was opposite for the two applications. The highest air concentrations were detected downwind; therefore, the highest concentrations were detected in different locations for the two applications.

It is possible factors other than weather also contributed to the differences in results. Some of these factors such as emission rates, tarpaulin permeability, soil characteristics and cold air drainage are still being evaluated by DPR staff.

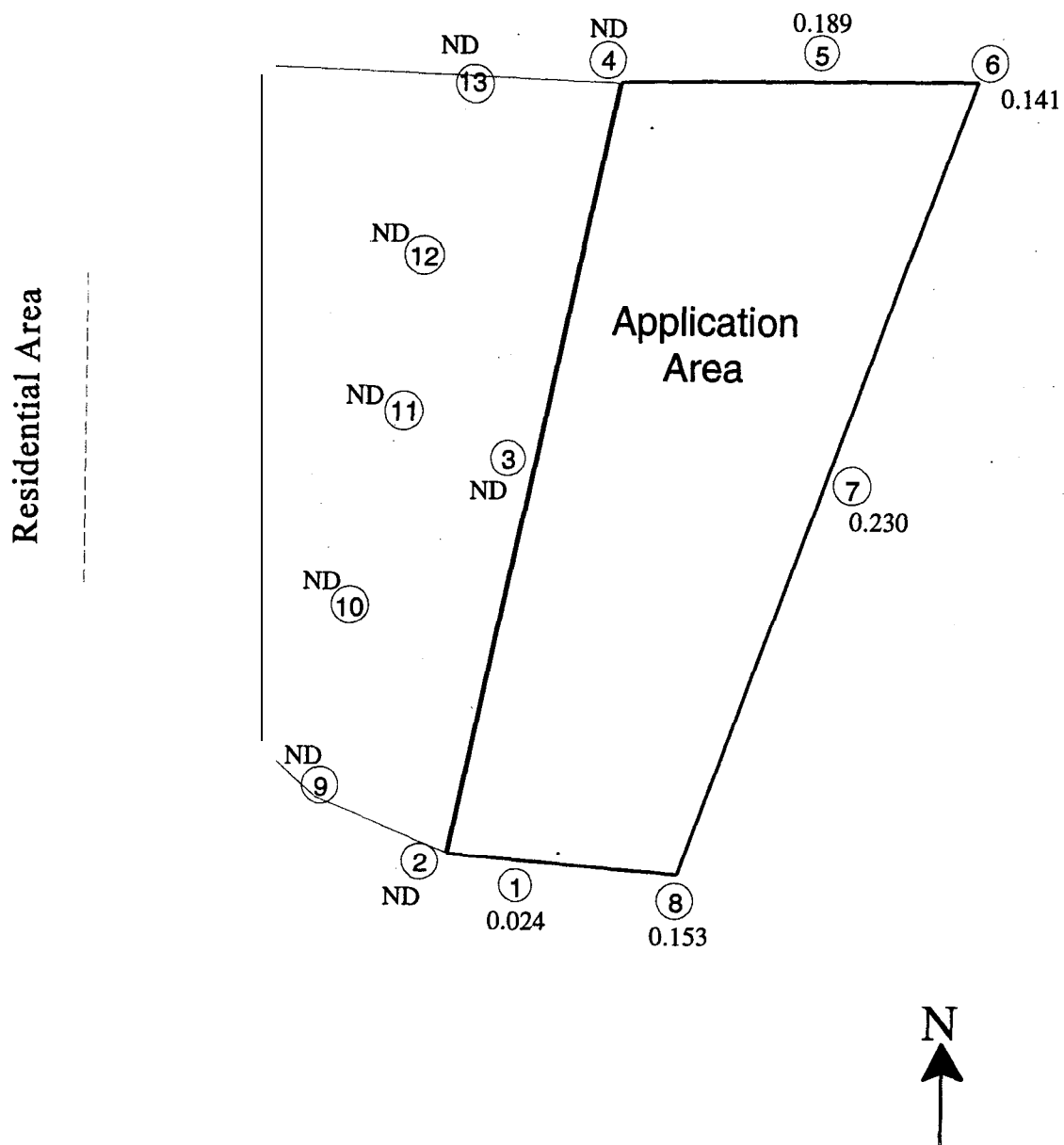
All twelve pairs of replicate samples agreed.

If you have any questions, please call me.

A handwritten signature in black ink, appearing to read "John S. Sanders". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

John S. Sanders, Ph.D., Chief
Environmental Monitoring and
Pest Management Branch
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Figure 1. The highest 24-hour time-weighted averages (ppm) for the first application (sampling periods 1, 2, 3).



Sites 1-8 are approx. 30 ft from field
Sites 9- 13 are 200 ft from field

Table 1. Methyl bromide concentrations during the first 48 hours of the first application.

Sampler Location			Methyl Bromide (ppm) During Each Period					
			06:00 - 12:00 ¹	12:00 - 18:00 ¹	18:00 - 6:00 ¹	6:00 - 18:00	18:00 - 6:00	24-hr Peak ¹
Site	Direction	Distance (ft)	(6 hrs)	(6 hrs)	(12 hrs)	(12 hrs)	(12 hrs)	(24 hrs)
1	south	23	ND	ND	0.048	0.037	0.011	0.024
2	southwest	30	ND	ND	ND	ND	ND	ND
3	west	30	ND	ND	ND (ND) ^{2,3}	ND (ND)	ND*	ND
4	northwest	24	ND	ND	ND	ND	ND*	ND
5	north	18	0.293	0.281	0.092	0.050	0.034	0.189
6	northeast	16	0.222	0.226	0.059	0.038	0.017	0.141
7	east	25	0.275	0.199	0.223 (0.222)	0.120 (0.099)	0.082	0.230
8	southeast	30	0.156	0.074	0.190	0.091	0.037	0.153
9	west	200	ND	ND	ND (ND)	ND (ND)	ND	ND
10	west	210	ND	ND	ND	ND	ND	ND
11	west	200	ND	ND	ND (ND)	ND (ND)	ND	ND
12	west	200	ND	ND	ND	ND	ND	ND
13	west	200	ND	ND	ND	ND	sample lost	ND

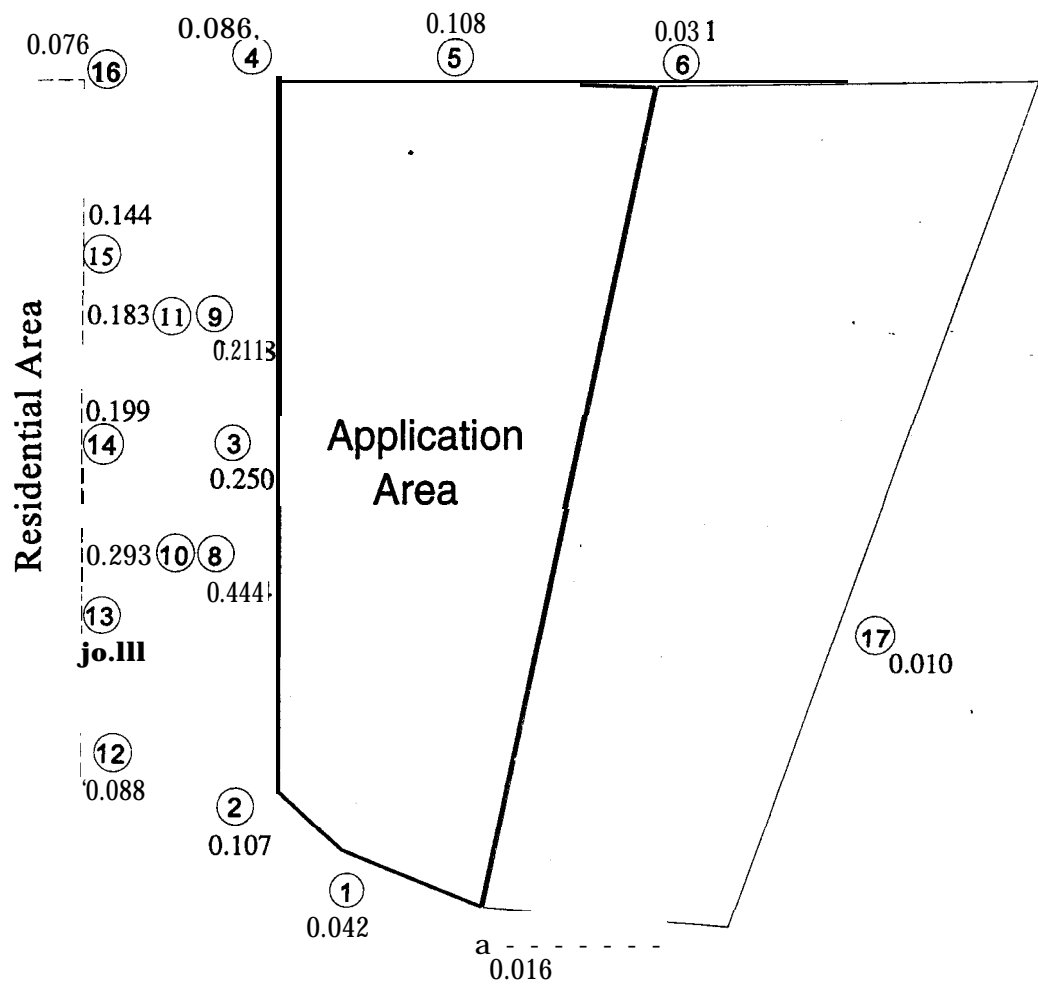
¹ the time-weighted average of the concentrations in bold represent the peak 24-hour concentrations

² no detectable amount, reporting limit 0.010 ppm

³ number in parentheses is the result for replicate DPR sample

* sampler shut off early due to depleted battery

Figure 2. The highest 24-hr time-weighted averages (ppm) for the second application (sampling periods 3, 4).



Sites 1-7 are 30 ft from field
Sites 8 and 9 are 60 ft from field
Sites 10 and 11 are 100 ft from field
Site 17 is 440 ft from field



Table 2. Methyl bromide concentrations during the first 48 hours of the second application.

Sampler Location			Methyl Bromide (ppm) During Each Period					
			06:00 - 12:00	12:00 - 18:00	18:00 - 6:00 ¹	6:00 - 18:00 ¹	18:00 - 6:00	24-hr Peak'
Site	Direction	Distance (ft)	(6 hrs)	(6 hrs)	(12 hrs)	(12 hrs)	(12 hrs)	(24 hrs)
1	south	30	0.077	0.069	0.052	0.032	ND ²	0.042
2	southwest	30	0.015	0.012	0.173 (0.176) ³	0.041 (0.035)	0.013	0.107
3	west	30	ND	ND	0.453 (0.428)	0.047 (0.042)	0.082	0.250
4	northwest	22	ND	0.014	0.143	0.028	0.074	0.086
5	north	15	0.106	0.408	0.098	0.118	0.079	0.108
6	northeast	27	0.121	0.224	0.021	0.042"	0.021	0.031
7	east	30	0.040	0.088	0.009	0.022	ND	0.016
8	west	60	ND	ND	0.841	0.046	0.051	0.444
9	west	60	ND	ND	0.405	0.031	0.083	0.218
10	west	100	ND	ND	0.548	0.038	0.038	0.444
11	west	100	ND	ND	0.333	0.032"	0.074	0.183
12	west	200	ND	ND	0.158	0.017	0.008	0.088
13	west	200	ND	ND	0.207"	0.015	0.027	0.111
14	west	200	ND	ND	0.384	0.015	0.051	0.199
15	west	200	ND	ND	0.272	0.016	0.052	0.144
16	west	200	ND	ND	0.140	0.012	ND	0.076
17	east	440/30 ⁴	0.012	0.029	0.007	0.012	ND	0.010

¹ the time-weighted average of the concentrations in bold represent the peak 24-hour concentrations

² no detectable amount, reporting limit 0.010 ppm

³ number in parentheses is the result for replicate DPR sample

⁴ sampler 440 feet from second application area, 30 feet from first application area

* sampler shut off early due to depleted battery